

# FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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## Flight.

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*With regard to photographs and descriptions of new British machines and those of our Allies, and other information which may be of help to our enemies, it should be noted that the Editor of FLIGHT, in the National interest, submits all matter of this character to the Official Press Censor before publication. Hence our readers will appreciate that many new departures in construction or advances in detail work are necessarily held back for the present rather than the smallest risk should be run of helping those who are so strenuously fighting the Allies for the enforcement of their "Kultured" militarism.—ED.*

## EDITORIAL COMMENT.

### The Pirates of the Air.

In the past we have had occasion to admire the genius of Count Zeppelin in the construction of his mammoth airships. We have sympathised with him, jointly with the German peoples, in the repeated disasters which have overtaken so many of the Zeppelin creations and their crews, although at the time it was in our mind that such craft might well be designed for ultimate attack against this country. But in that view it never suggested itself that the Zeppelin and kindred aircraft would be brought within the sphere of war operations other than upon recognised civilised lines. That their use could ever be so basely prostituted as to, under the cloak of night, deliberately bombard unfortified towns and the residential sections of cities, with but one possible object, the murder of non-combatants, and the destruction of sacred edifices, monuments and private property, never entered our minds. In those days, whatever we

may have thought of Germanic aggressiveness, we at least gave the nation credit for a modicum of real "culture," and of being incapable of the acts by means of which they have by now estranged practically every nation on the face of the globe. The Paris episodes this week constitute but another nail in the coffin of German "kultur," whilst at the same time there is no compensating side, as fear and panic over the Zeppelin attacks have been entirely absent with the Parisians. That the visits was not to London was hardly the fault of the raiders. On balance we fancy they would have preferred the Metropolis, but failing being able to wreak their spleen and hatred in this country, they have had to content themselves with the abortive and ridiculous adventure over the capital of our French allies. Truly the visit appears to have given the inhabitants the opportunity for a great time, and the bugle-call—the "Garde à Vous"—which announced the approach of hostile aircraft, so far from causing the populace to bolt like rabbits to underground for safety, brought them into the streets by the thousands to watch the course and methods of these Goths. Again America has unanimously sent up a cry of disgust at the proceedings, dubbing them "assassinations from a moonless sky"; whilst the *New York Herald*, in a strong condemnatory article, regards the raid as "among the worst performances in atrocious and merciless warfare which began with the invasion of Belgium."

"Germany," continues the *Herald*, "has lost sympathy because of these very methods which depart from all rules of civilised warfare, and make non-combatant men, women, and children the object of their attack."

"When a fleet of balloons at dead of night sweeps over a city, raining explosive and incendiary bombs on factories and homes, all the instincts of humanity cry out in condemnation. The worst aspect is that it is deliberate, and that the perpetrators see in it nothing wrong."

The fact that little or no damage resulted, in no way lessens the German Staff's guilt. Their hope and intention was to inflict widespread destruction on both humans and material property, and that is the evidence which, when the settling up time arrives, they will have to combat. And in that indictment will be included the multitude of other murderous visits, whether by their dirigibles or aeroplanes, to British shores and other unfortified towns in our Allies' country.

It is only necessary to study the official and other reliable sources of information to appreciate how widely

different British methods are, in making military strongholds only the objective of their air attacks. Rather than risk the harming of innocent members of the enemy community, our flying officers have repeatedly refrained from loosing their weapons of destruction where they have failed to identify with certainty the point of attack.

What those objectives of our pilots and those of our Allies are may best be judged by the bunch of "excursions," of which report is made, almost immediately following, and by way of a set off to, the assassins' midnight visit to Paris. In these only moving troops, railway stations, military centres of aviation, barracks, batteries, captive balloons and such legitimate targets were aimed at—we hope with telling effect—whilst again,

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## The Roll of Honour.

THE following casualty in the Expeditionary Force has been officially reported from the General Headquarters (undated):—

Captain R. Cholmondeley, Rifle Brigade and R.F.C.

It is unofficially announced that Second Lieut. S. P. Cockerell, of the Royal Flying Corps, died suddenly from acute smallpox in Egypt on the 20th inst.

## Aerial Attacks on Steamers.

DURING the past week several reports have been made regarding attacks on steamships from German aeroplanes. On Sunday, the Belgian Relief Ship "Elfland," bound for Rotterdam, when near the Maas lightship, had five bombs thrown at her, but fortunately was not damaged. The Dutch steamer "Zevenbergen" was also attacked off the North Hinder, one bomb ex-

by way of contrast, in retaliation the Germans, amongst other gallant deeds, replied by bombarding a Red Cross hospital, the range of which was given by an aeroplane, and by dropping bombs on Lillers, St. Omer and Estaires, the latter efforts effecting a bag or 3 women and 4 civilians killed and a dozen other civilians wounded. How much the German pilots cared where their missiles landed so long as they hit *something* may be gauged from the fact that they launched their bombs from heights of some 9,000 feet. Their bomb operations by aeroplane on the high seas against merchant vessels are as contemptible as they are ineffective, and we do not doubt but that they will ere long receive a telling lesson from our aerial fleet.

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ploding about seven yards from the vessel. About the same time and place the s.s. "Pandion" had seven bombs launched at her. The s.s. "Teal," on arrival in London on Wednesday, reported having had four bombs dropped on her about thirty miles off the Dutch coast. It was also reported that the aviators used a machine gun and dropped a shower of darts.

## German Aeroplane off Dover.

SOME excitement was caused in the vicinity of Deal on Saturday morning by the appearance of a German aeroplane, which dropped several bombs in the Downs, and turned back as soon as fired on by a patrolling cruiser. The machine was first seen about 11.35 a.m. coming in over the eastern part of the Goodwin Sands. One bomb fell near the derelict "Montrose" on the Goodwins, others fell alongside the U.S. barque "Manga Reva" and the Dutch s.s. "Flora."



PARIS, AS SEEN FROM AN AIRSHIP.—The Champs Elysées, the Place de la Concorde, and the Seine, from a height of 500 metres.





THE PANAMA-PACIFIC EXPOSITION AS SEEN FROM AN AEROPLANE.—This picture of the great Exposition at San Francisco that opened on February 20th was taken from an aeroplane 500 ft. above the ground. It gives an excellent idea of the plan of the Exposition, and of its geographical relation to the city. Already the Exposition bids fair to be highly successful.

# AIRCRAFT WORK AT THE FRONT.

## OFFICIAL INFORMATION.

IN an Admiralty note regarding the Dardanelles operations, published on Monday, there was the following:—

"Unfavourable weather has interrupted the operations in the Dardanelles, and, as seaplane reconnaissance has not been possible, the amount of damage done to the forts by the bombardment of the 18th cannot be ascertained."

The following announcement was made by the Admiralty on Wednesday afternoon:—

"The following has been received from Wing-Commander Longmore:—

"I have to report that a successful air attack was carried out this morning (Wednesday) by five machines of the Dunkirk Squadron on the German submarines being constructed at Hoboken, near Antwerp. Two of the pilots had to return owing to thick weather, but Squadron Commander Ivor T. Courtney and Flight Lieut. H. Rosher reached their objective, and after planing down to 1,000 ft., dropped four bombs each on the submarines. It is believed that considerable damage has been done to both the works and two submarines. The works were observed to be on fire. In all, five submarines were observed on the slip. Flight Lieut. B. Crossley-Meates was obliged by engine trouble to descend in Holland. Owing to the mist the two-pilots experienced considerable difficulty in finding their way and were subjected to a heavy gun-fire whilst delivering their attack."

In the bi-weekly report of Sir John French, issued on Tuesday, there was the following:—

"On Saturday and Sunday the enemy's aircraft displayed unwonted activity, weather conditions being particularly favourable. Bombs were dropped on Lillers, St. Omer, and Estaires. The material result was slight, the only buildings which were damaged being private property, neither occupied by soldiers nor used for military purposes. The total damage to *personnel* was three women and four civilians killed, and about half-a-dozen civilians wounded. These bombs were dropped from a great height, in one case as much as 9,000 feet (nearly 1½ miles). This, of course, prevented the airman from taking deliberate aim at any military objective.

"This procedure is a great tribute to the respect in which our Royal Flying Corps is held by the enemy, as the airman increases his chances of escaping pursuit by taking advantage of the time required for our aircraft to get the necessary height from which to engage."

In the despatch dated, March 16th, from an "Eye-witness" present with the British General Headquarters, there was the following:—

"During the 12th and 13th our airmen carried out raids on the railway junctions at Don and Douai; considerable damage was effected at both places, and at Don a portion of a train was destroyed."

In a *communiqué* regarding operations in Egypt, issued in Cairo on Saturday, there was the following:—

"Since the last official *communiqué* there has been nothing to report. Patrol and aeroplane reconnaissances show that there is very little activity amongst the enemy's outposts, which remain in the same places as before, some four days' march from the Canal."

The following was included in an official statement issued in Cairo on Tuesday:—

"On Monday at dawn one of our patrols discovered a party of the enemy near El Kubri post, opposite Suez. Shots were exchanged; aeroplanes estimated the number at about 1,000, composed of infantry, artillery, and a few cavalry. The guns at El Kubri opened fire and inflicted

casualties, whereupon enemy retired and formed camp eight miles east of Canal."

In the afternoon *communiqué* issued in Paris on the 17th it was stated:—

"There has been an artillery duel in the Woivre, and one of our aviators has dropped bombs on the barracks at Colmar."

In the afternoon *communiqué* issued in Paris on the following day it was noted:—

"In Lorraine: Artillery duel. One of our aviators bombarded the railway station at Conflans."

In the evening *communiqué* there was the following:—

"A Zeppelin dropped some bombs on Calais, aiming at the railway station. No serious material damage was done, but seven employes were killed."

The following French official announcement regarding the Zeppelin raid on Paris was issued on Sunday:—

"Between 1.15 and three o'clock this morning four Zeppelins started for Paris, coming from the direction of Compiègne, and following the valley of the Oise. Two of them were compelled to turn back before reaching Paris, one at Ecouen, the other at Mantes. The two others were attacked by anti-aircraft guns, and only passed over the outlying districts of the north-west of the city and the neighbouring suburban districts. They withdrew after having dropped a dozen bombs. The damage to property was of little importance. Seven or eight persons were struck, only one being seriously injured. Various anti-aircraft posts opened fire on the Zeppelins, which were constantly lighted up by searchlights. One of them appears to have been hit. Aeroplane squadrons took part in the action, but mist hampered them in their pursuit. To sum up, the Zeppelin raid on Paris was a complete failure, and only served to demonstrate how well the defensive arrangements adopted work. The population of the city remained perfectly calm. On their way back the Zeppelins dropped a dozen incendiary or explosive bombs on Compiègne, which only did a little unimportant damage. Three other bombs were dropped on Ribecourt and Dreslincourt, to the north of Compiègne without any result."

A later note gave the following further details:—

"At Asnières eight bombs were dropped and three people were wounded. At Neuilly a slight fire was caused in a house, but was rapidly put out. Nobody was hurt. At Levallois a one-storey house was destroyed. At Courbevoie a workman received trivial injury and another slight injury. In Paris bombs were dropped in the rue des Dames and the rue Ducloux. No victims. In the Department of Seine-et-Oise and at Saint Germain Zeppelins were reported between half past one and two o'clock. At Mantes they were fired at from the fort. At Poissy three bombs were dropped, two of which were explosive bombs. No victim. The passage of Zeppelins was likewise reported from Domont and Argenteuil."

The following appeared in the French *communiqué* issued on Tuesday afternoon:—

"The enemy bombarded Rheims. There were three victims of a German airman's bombs among civilians."

The following was officially issued in Paris on Tuesday evening:—

"In consequence of the defeats sustained by them at La Boisselle, the Germans bombarded the civil hospital of Albert. The Red Cross flag was flying over the hospital. The bombardment was carried out after the



range had been found by an aeroplane, and several projectiles found their mark. Five old men were killed and several others were wounded. The Mother Superior was seriously injured. The French aviators have actively and effectively replied to the impotent Zeppelin raid on Paris on Saturday night.

"In Belgium on Sunday twenty bombs were dropped on the aerodrome at Gits, and on the railway and stations of Lichterfelde and Essen. An Aviatik was chased as far as Roulers, carbine shots being fired at it. Ten 90 millimetre bombs were dropped on the stations of Merkem and Wyfvege. Further to the south near La Bassée two enemy aeroplanes were pursued and were forced to return to their lines. The station of Foye was effectively bombarded. In the valley of the Aisne an Aviatik was put to flight by two of our aeroplanes.

"In Champagne 500 arrows were dropped on a German captive balloon, and several bombs on the station of Bazancourt, and on the enemy batteries at Brimont and Vailly. A German aeroplane was pursued to the north of Rheims. In Alsace Pilot-Sergeant Falze and Sub-Lieut. Moreau brought down an Aviatik on the railway to the west of Colmar. Six bombs were dropped on the station of Cernay, and the barracks at Mulheim and the station of Altkirch were effectively bombarded. On Monday in Belgium we bombarded the station of Staden, near Roulers, and several camps, while bombs were also successfully dropped on the aviation ground at La Bruquette, near Valenciennes. In the Aisne region the barracks of La Fere, the stations of Anizy, Chauny, Tergnier, and Coucy le Chateau were struck by our aeroplanes.

## THE BRITISH AIR SERVICES.

*UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.*

### Royal Naval Air Service.

THE following announcement was made by the Admiralty on the 18th inst. :—

Lieut.-Commander P. F. M. Fellowes, retired, to the "President," additional, for gunnery duties with Director of Air Department.

The following announcement was made by the Admiralty on the 19th inst. :—

The undermentioned officers have been granted the temporary rank of Captain whilst holding the appointment of Flight-Commander in the Royal Naval Air Service: Lieuts. C. H. Collett, D.S.O., R.M.A., and C. E. Robinson, R.M.L.I. Dated Feb. 23rd.

Temporary Midshipman F. G. E. Wiseman, R.N.R., transferred to the Royal Naval Air Service as Probationary Flight Sub-Lieutenant, and appointed to the "President," additional, for R.N.A.S. To date March 18th.

W. D. Wain, J. Forgan-Potts, C. V. Arnold, R. G. A. Baudry, and G. G. Dawson entered as Probationary Flight Sub-Lieutenants, and appointed to the "President," additional, for R.N.A.S. All to date March 18th.

E. C. Bingham entered as Probationary Flight Sub-Lieutenant for temporary service, and appointed to the "President," additional, for R.N.A.S.

The following announcement was made by the Admiralty on the 22nd inst. :—

Flight Commanders: J. Dolben Mackworth promoted to the rank of Squadron-Commander, and appointed to the "President," additional, for R.N.A.S.; to date March 18th. J. H. Lidderdale to the "President," additional, for R.N.A.S.; to date March 19th.

Acting Flight Sub-Lieut. S. Medlicott confirmed in rank of Flight Sub-Lieutenant, with seniority Dec. 4th, 1914, and re-appointed as Acting Flight Lieutenant. To date March 19th.

H. Spencer Kirby and J. Turner Bone entered as Probationary Flight Sub-Lieutenants for temporary service, and appointed to the "President," additional, for R.N.A.S. To date March 21st.

In Champagne the aviation ground and the ammunition stores of Pont Faverges were bombarded day and night with 90 millimetre bombs. Forty bombs were dropped on the station of Conflans-Jarny and the adjoining railway lines. The effectiveness of the bombardment was verified. The barracks and the station of Freiburg, in Breisgau, received eight bombs. At 10.50 in the evening of March 22nd, three bombs were dropped on Villers-Cotterets, and a Zeppelin was noticed proceeding westward. The alarm was given in Paris, where all the measures provided for were taken."

In a *communiqué* issued in Petrograd on Sunday there was the following :—

"In the Bobr marshes, near Eastrzembe, we captured a German aeroplane with an officer."

A semi-official note issued in Petrograd on Sunday stated :—

"On Friday last, besides an aeroplane, three balloons with officers and mails left Przemyśl, but in consequence of a change of wind which carried them northwards they were forced to come down at Sokal, Brestlitovsk, and Kamenetzlitovsk, where the inhabitants captured the airmen."

An official telegram from Cetinje received by Sir J. Roper-Parkington, Consul-General for Montenegro, on the 22nd inst., contained the following :—

"Austrian aeroplanes have daily passed over our various camps, dropping bombs and attacking with quick-firing guns without any appreciable effect."

Hon. Second Lieut. R. A. Reid, Royal Marines, transferred to Royal Naval Air Service as Probationary Flight Sub-Lieutenant, for temporary service, and appointed to the "President," additional, for R.N.A.S. To date March 30th.

Newburn Hall entered as Warrant Officer, Second Grade, for temporary service, and appointed to the "President," additional, for R.N.A.S. To date March 21st.

### Royal Flying Corps (Military Wing).

THE following appeared in a supplement to the *London Gazette* issued on the 17th inst. :—

*Special Reserve. Supplementary to Regular Corps.*—Second Lieut. J. T. C. Moore-Brabazon to be Lieutenant; dated Feb. 19th, 1915. The undermentioned to be Second Lieutenants (on probation): O. D. Filley; dated March 2nd, 1915. H. S. Coles; dated March 3rd, 1915.

*King's (Liverpool Regiment).*—Second Lieut. D. C. Ware is seconded for service with the Royal Flying Corps. Dated Jan. 5th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 20th inst. :—

The undermentioned appointment is made: Equipment Officer: Second Lieut. P. R. Grace, Special Reserve, and to be temporary Captain. Dated Jan. 16th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 22nd inst. :—

The undermentioned Serjeant-Majors to be Quartermasters, with the honorary rank of Lieutenant; dated March 1st, 1915: J. Ramsay, J. Starling, A. Levick, A. H. Measures, F. H. Unwin, J. H. Wilford, W. R. Bruce, and W. J. Ryan.

*Special Reserve. Supplementary to Regular Corps.*—A. E. Snape to be Second Lieutenant (on probation). Dated March 15th, 1915.

The following appeared in the *London Gazette* issued on the 23rd inst. :—

The undermentioned appointment is made: Adjutant: Capt. A. F. S. Leggatt, Royal Scots (Lothian Regt.), and to be seconded. Dated Feb. 23rd, 1915.

### Central Flying School.

THE following announcement was made by the Admiralty on the 22nd inst. :—

Flight Sub-Lieut. P. C. V. Perry to the "President," additional, as Instructor at the Central Flying School. To date March 19th.

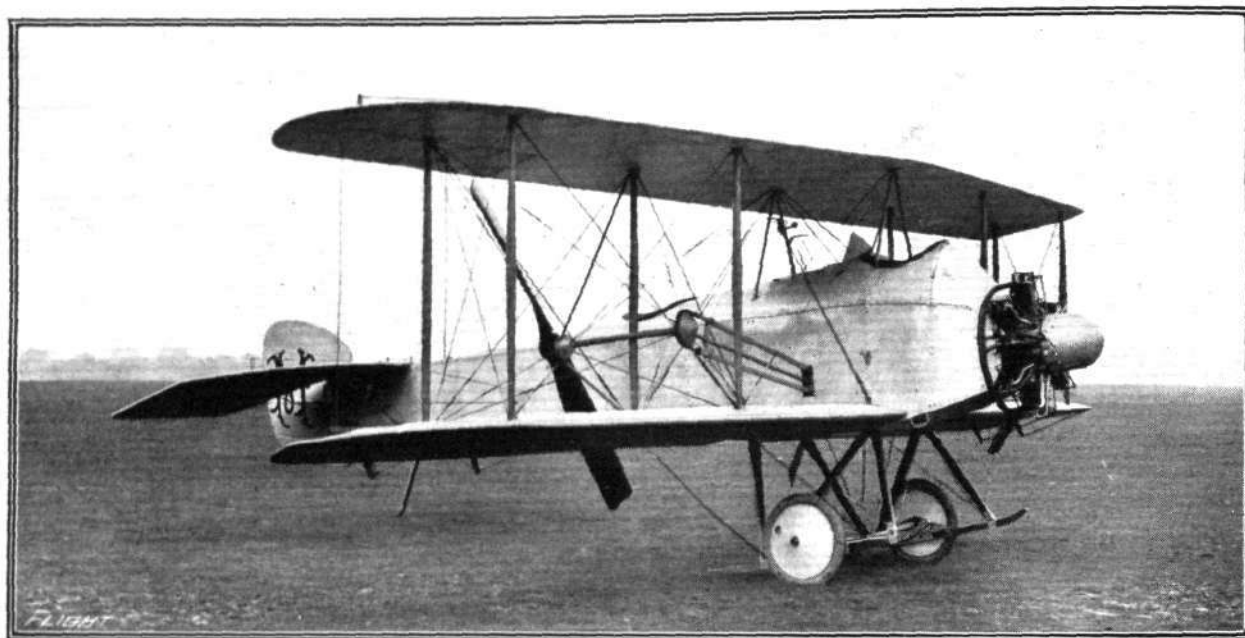
## THE NEW "MANN" BIPLANE.

AMONG the new machines that have made their appearance lately, one of the most original is the Mann "pusher" biplane, built by Messrs. Mann and Grimmer, and erected at Hendon a short while ago. As reported in *FLIGHT* some time back, it flew successfully for the first time of asking, and last week further flights were made, a few modifications having been made. On both occasions Mr. Rowland Ding was the pilot.

Briefly speaking, the Mann biplane is a fuselage machine with the engine in front and the two chain-driven propellers at the rear of the main planes. In the

cockpit, from whence the pilot is able to look straight down behind the lower main plain and to obtain a good view in a forward direction over the leading edge of the lower plane. The tail planes are of large size, and consist of the usual members, a fixed stabilising plane, a divided elevator, and the rudder. The under-carriage is of the wheel and skid type, the two disc wheels being carried on short stub axles sprung from the skids by rubber shock-absorbers.

The main planes, of which both upper and lower are fitted with inter-connected ailerons, have a slight



extreme nose of the very deep body is placed the seat for the observer or gunner, and from here an unrestricted view is obtained owing to the absence of a tractor screw to obscure the view. A 100 h.p. Anzani drives the two propellers through a shaft and chain transmission—designed by Mr. Leper, who has had many years experience with chain transmission—the shaft terminating at the rear in a spur gearing driving the sprockets, so that crossing of one chain is avoided although the propellers run in opposite directions.

A short distance behind the main planes is the pilot's

backward sweep similar to that found in a number of German machines. This, however, only applies to the leading edge, as the trailing edge is straight, as seen in plan.

Owing to the unusual design of this machine, a considerable amount of interest attaches to its forthcoming trial flights. If the new "Mann" biplane proves a success from the aerodynamical point of view, it should be of value for military purposes, owing to the facility with which a gun can be mounted in the nose of the body.

### Fatal Accident at Brooklands.

It is with the greatest regret that we have to record the first fatality at Brooklands Aerodrome since it was taken over by the Government. The accident occurred on Monday, Captain J. F. A. Kane, when flying an 80 h.p. Blériot-parasol, falling from a height of 150 feet. At the inquest on Tuesday it was stated that Captain Kane made three flights on the machine on Sunday and immediately before the fatal flight it was examined and found to be in order. Sergeant Littlejohn, R.F.C., said that when at a height of 150 ft. Captain Kane made a terribly sharp right-hand turn—practically in the length of the machine, which suddenly dived nose first to the ground. The accident, in witness's opinion, might have been due either to an error of judgment or to some disturbance in the air.

### The Royal Flying Corps Aid Committee.

THE Aid Committee of the Royal Flying Corps have left 3, Queen Anne's Gate, and by kind permission of Lady Battersea now have their headquarters at Surrey

House, Marble Arch, where all letters, parcels, &c., should be addressed. Through the courtesy of the undermentioned gentlemen, a full list of subscribers to the Fund can be seen at their offices at any time:—The Manager, National and Provincial Bank, 6, Victoria Street; the Secretary of the Royal Aero Club, 166, Piccadilly.

### Norway Stops Aluminium for Zeppelins.

THE *Daily Mail* correspondent in Copenhagen on Monday reported the following:—

"A telephone message from Christiania to-day says that 170 tons of aluminium in ingots exported to a neutral country were discovered on their way to Germany.

"Steps have been taken to prevent the aluminium from reaching Germany. It is estimated that this aluminium is sufficient to build 80 Zeppelins."

### Italy's Air Services.

ACCORDING to information published in the Rome newspapers, during the last few weeks 220 aviators have received the pilot's certificates, and the Italian army has now at its disposal 300 aeroplanes and 20 dirigibles.



# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## ANNUAL GENERAL MEETING.

THE Annual General Meeting of the Royal Aero Club was held on Tuesday last, the 23rd inst., at 166, Piccadilly, London, W. Professor A. K. Huntington, the Acting Vice-Chairman of the Club, presided, and there were about 40 members present.

Professor A. K. Huntington, in opening the Meeting, reviewed the work of the year, and said that from the accounts for 1914, which were passed by Aero Proprietary Limited at its General Meeting that afternoon, it would be seen that the Club's finances were very satisfactory.

297 Aviators' Certificates had been granted during the year 1914, the total number issued by the Club at December 31st, 1914, being 1,002. 117 had been issued this year, the total now being 1,119.

The following British Record had been made during 1914:—

Height—Pilot alone.

Eng.-Lieut. E. F. Briggs, R.N., Eastchurch, March 11th, 1914, 14,920 ft.

The World's records created during 1914 were:—

Height—6,170 metres (20,237 ft.).

Duration—(In a closed circuit without alighting) 21h. 48m. 45s.

The Britannia Challenge Trophy presented by Mr. H. Barber for the most meritorious performance in the air by a British aviator during the year had been awarded to Squadron-Commander J. W. Seddon, R.N.A.S., for his seaplane flight from Isle of Grain to Plymouth via Calshot, on January 21st, 1914, a distance of approximately 325 miles, which had been accomplished in 5 hours 25 mins.

Another noteworthy performance by a British aviator had been the winning of the Jacques Schneider International Maritime Trophy at Monaco, on April 20th, 1914, by Mr. C. H. Pixton on a Sopwith hydro-biplane.

One of the features of the year had been the winning by Mr. W. L. Brock, the American aviator, of the following races:—

London to Manchester and back. Aerial Derby. London to Paris and back.

The London-Paris-London race had been organised by the Royal Aero Club, the prizes, which amounted to £1,000, being given by the International Correspondence Schools £700, and the Royal Aero Club £300.

The other important competitions, viz., the *Daily Mail* Circuit of Britain and the Gordon-Bennett International Cup, had been postponed on account of the War.

Many other minor competitions had been held at Hendon and Brooklands under the Competition Rules of the Royal Aero Club.

The Government Competition for Aeroplane Engines had been won by the Green Engine Company. This Competition was open to British manufacturers only, and a very large number competed, including British manufacturers of engines of foreign design, which made the success of the Green Engine Company the more noteworthy.

The Society of Motor Manufacturers and Traders, supported by the Club, promoted in March, 1914, the most successful Aero Exhibition yet held in this Country. The services rendered by the Society of Motor Manufacturers and Traders in organising these Exhibitions had been very much appreciated.

The Accidents Investigation Committee had continued its work up to the time of the War, when eight reports on fatal accidents had been issued since January 1st, 1914.

The consideration of the question of obtaining new premises had been postponed on account of the War, but it was hoped that a move would be made in the matter immediately circumstances were more favourable than at the present time.

The Duke of Argyll, the President of the Club, died in May, 1914, and Lord Roberts, a Vice-President, in November, 1914.

One of the greatest losses to British aviation during the year had been that of Mr. Gustav Hamel. Another regrettable loss had been that of Mr. R. T. Gates, General Manager of the Grahame-White Aviation Company.

At the beginning of the War the Club had rendered a service to its Country by issuing an Appeal through its Chairman, the Marquess of Tullibardine, inviting civilian aviators to volunteer their services in case of emergency. As a result almost all of the civilian aviators had responded to the call and had since been engaged on naval or military work.

Apart from the large number of Members of the Club engaged in

the manufacture and testing of aircraft, about four hundred, as far as could be ascertained, were at present on active service.

Although the Club had lost several Members killed on active service, the casualties in the Flying Services had so far not been great, the number reported killed or missing since the commencement of the War being estimated at thirty-five. Eleven of these casualties had been the result of accidents in this country.

At the end of last year the Club, with the approval of the Admiralty and War Office, had instituted and agreed to administer a fund for the benefit of the Flying Services, the subscriptions to which now amounted to £7,707 2s. 5d.

Among other features of the year were the Balloon Races at Hurlingham and the free admission obtained by the Club for Members to the London Aerodrome, Hendon, which was widely appreciated.

Although, on account of the War, some part of the work of the Club had necessarily had to be held over, such as the organisation of competitions and the investigation of accidents, the Club was progressing in a satisfactory manner, and continuing to do useful work.

**Election of Vice-President and Council.**—On the motion of Mr. C. F. Pollock, seconded by Mr. C. G. Grunhold, the Vice-President and Council for the ensuing year were unanimously elected as follows:—

*Vice-President*—The Rt. Hon. Lord Northcliffe.

### Council.

S.A.I. Prince Roland Bonaparte (President F.A.I.).

The Rt. Hon. The Earl of Hardwicke.

The Rt. Hon. The Earl of Lonsdale.

The Rt. Hon. Lord Howard de Walden.

The Rt. Hon. Lord Kinnaird, F.R.G.S.

The Rt. Hon. Lord Montagu of Beaulieu.

Admiral of the Fleet The Rt. Hon. Sir Edward Seymour, P.C., G.C.B., O.M., G.C.V.O.

Admiral The Hon. Sir Edmund Fremantle, G.C.B., C.M.G.

Count Henry de La Vaulx (Vice-President Aero Club de France).

Sir David Salomons, Bart.

Sir Norman Lockyer, K.C.B., F.R.S.

Professor Sir William Crookes, O.M. (President Royal Society).

Sir Hiram S. Maxim.

The Rt. Rev. Bishop Welldon.

Martin Dale.

Henry Deutsch de la Meurthe (President Aero Club de France).

**Alteration to Club Rules.**—On the motion of Mr. C. F. Pollock, seconded by Mr. Ernest C. Bucknall, the alteration in the following Rule was unanimously confirmed:—

"7. Ballot Papers.—Not less than 7 days before the Annual General Meeting a ballot paper shall be posted to every Member. The ballot paper shall contain the names of candidates nominated for the Committee in the form of an alphabetical list. The same type is to be used throughout. In the event of the number of candidates nominated for election to the Committee not exceeding the number of vacancies, no ballot paper shall be sent, the candidates so nominated being *ipso facto* elected."

**Election of Committee.**—The election of the following Members to the Committee was announced:—

Griffith Brewer.

Ernest C. Bucknall.

John D. Dunville.

Col. H. C. L. Holden, C.B., F.R.S.

Prof. A. K. Huntington.

Flight Commander F. K.

McClellan, R.N.A.S.

Squadron-Commander Alec

Ogilvie, R.N.A.S.

Mervyn O'Gorman, C.B.

C. F. Pollock.

**Notices of Motion.**—On the motion of Mr. Martin Dale, seconded by Mr. A. Mortimer Singer, it was unanimously resolved:—

That the Committee shall have power during the continuance of the War to appoint one or more additional Vice-Chairmen to hold office until the next Annual General Meeting.

On the motion of Prof. A. K. Huntington, seconded by Mr. Eric H. Clift, it was unanimously resolved:—

That the Committee shall have power to co-opt Temporary Members to the Committee during the continuance of the War, to hold office until the next Annual General Meeting.

**Vote of Thanks to Chairman.**—On the motion of Mr. C. G. Grunhold, seconded by Mr. Joseph Zeitlin, a unanimous vote of thanks was passed to the Chairman.

A vote of thanks to the Committee for their services during the year concluded the proceedings.

## Aviators' Certificates.

The following Aviators' Certificates have been granted:—

- 1114 2nd Lieut. Alexander Cecil Clarke, D.C.L.I. (Maurice Farman Biplane, Royal Flying Corps, Farnborough). March 2nd, 1915.
- 1115 2nd Lieut. John Ollis Mullins (6th Battn. Middlesex Regt.), (Maurice Farman Biplane, Royal Flying Corps, Shoreham). March 13th, 1915.
- 1116 Flight Sub-Lieut. Charles William Fairfax Morgan, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). March 14th, 1915.
- 1117 Preston Albert Watson (L. and P. Biplane, London and Provincial School, Hendon). March 16th, 1915.
- 1118 William Jamieson McConnochie (Hall Biplane, Hall School, Hendon). March 16th, 1915.
- 1119 Flight Sub-Lieut. Laurence Pratt Openshaw, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Hendon). March 17th, 1915.
- 1120 2nd Lieut. Ernest Leslie Gossage, R.F.A. (Maurice Farman Biplane, Royal Flying Corps, South Harrow). March 10th, 1915.
- 1121 2nd Lieut. Humphrey Minton Goode (County of London Yeomanry, Territorial Force) (Maurice Farman Biplane, Royal Flying Corps, Farnborough). March 11th, 1915.
- 1122 Lieut. Ralph Towlestone Leather (Warwickshire Yeomanry, Territorial Force) (Maurice Farman Biplane, Royal Flying Corps, Shoreham). March 16th, 1915.
- 1123 Lieut. Lawrence Werner Wyld Lees, R.G.A. (S.R.) (Maurice Farman Biplane, Royal Flying Corps, South Harrow). March 17th, 1915.
- 1124 Flight Sub-Lieut. Arthur Vere Tabor, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Hendon). March 18th, 1915.
- 1125 William George Cullen (Maurice Farman Biplane, Military School, Brooklands). March 21st, 1915.

## Presentation to the Club.

Flight Commander F. K. McClean, R.N.A.S., has very kindly presented to the Club a model of the Short Biplane on which he flew from Alexandria to Khartoum early last year.

## THE FLYING SERVICES FUND.

Administered by The Royal Aero Club.

THE Lords Commissioners of the Admiralty and the Army Council having signified their approval, the Royal Aero Club has instituted and will administer a fund originated by M. André Michelin for the benefit of

officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependents of those who are killed.

The fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

In view of the great utility of the work of the Flying Services, evidence of which has been repeatedly given in the official despatches of the Commander-in-Chief, the skilful and daring flights into enemy country, and the protection afforded by the continuous patrolling of our coast by aircraft, it is confidently expected that the British public will welcome this opportunity of showing their appreciation by subscribing promptly and liberally to the fund.

The Right Hon. Lord Kinnaird has kindly consented to act as Honorary Treasurer to the Fund.

Subscriptions should be forwarded to The Flying Services Fund, The Royal Aero Club, 166, Piccadilly, London, W., or to Barclay and Co., Ltd., 1, Pall Mall East, London, S.W. Cheques should be crossed "Barclay and Co., Ltd."

TULLIBARDINE, Brig.-General,

Chairman of the Royal Aero Club.

	£	s.	d.		£	s.	d.
Total subscriptions received to March 17th, 1915...	7,507	13	5	Gordon H. Brown ...	5	0	0
Miss G. Bacon ...	0	10	0	St. Ann's Church, Belfield ...	0	10	0
George H. Law ...	10	0	0	E. Brocklehurst ...	5	5	0
Theodore D. Morison ...	2	0	0	Fred May ...	50	0	0
Percy J. Home ...	1	1	0	The Green Engine Co., Ltd. ...	50	0	0
C. P. Pizey ...	5	5	0	Percy Wright-Anderson ...	3	3	0
Edward Wauhope ...	1	0	0	The Children and Teachers of King's M. Northfield ...	0	5	0
Anonymous ...	10	10	0	Somborne School ...	0	5	0
Miss Bateman ...	0	5	0	T. J. Waddingham ...	1	1	0
W. Oliver ...	0	2	0	Capt. Godfrey M. Paine ...	5	0	0
Miss Winifred Leslie ...	0	3	6	Employés of the Oxygen Welding Co. ...	1	0	0
Miss Clapham ...	0	10	0	Per W. ...	3	17	0
E. W. Dixon ...	2	0	0				
Miss R. Stanley ...	0	2	6	Total, March 24th, 1915 ...	£7,720	8	5
Mr. and Mrs. Taylor ...	2	2	0				
George V. Todd ...	1	0	0				
George Hann ...	50	0	0				

166, Piccadilly, W. B. STEVENSON, Assistant Secretary.

## The Zeppelin Raids on Calais.

ABOUT 12.30 a.m. on March 18th, Calais was visited for a second time by a Zeppelin, which dropped incendiary and explosive bombs. The night was very calm and a thick mist prevailed, so that, when it was reported from Mark between Dunkirk and Calais that a Zeppelin had been sighted, the searchlights were handicapped in their work, while the anti-aircraft guns were unable to render effective service. The first bomb fell in a railway shed near the Central station, and set fire to a truck in which refugee employees from Lille were sleeping; seven were killed and one fatally injured. Another bomb fell on Notre Dame Cathedral, damaging the roof of a chapel and breaking a lot of stained glass windows. A bomb also fell on the Lamarq hospital, which is full of Belgian wounded. Other bombs fell round Fort Nuley and the Post Office, but the damage done was insignificant. The raider arrived from the westward, and disappeared in the direction of Dunkirk.

Two nights later another Zeppelin visited the town, but was driven off by the guns of the forts, and disappeared out to sea.

## The Raid on Paris.

ELSEWHERE, on page 206, are given the French official reports regarding the Zeppelin attack on Paris early on Sunday morning, and very little more information is available on the subject. About 1.15 a.m. firemen went round the city warning the people, by means of a bugle-call—the Garde à Vous—to take shelter, and meanwhile all the street lights were extinguished. Information had been received from Compiègne that a Zeppelin had been sighted, and the first airship arrived over the capital about two o'clock, arriving from the westward. It was fired on by the guns at Fort Mont Valerien, and together with the second airship, which was much higher, proceeded over the northern outskirts, eventually, a few minutes after 3 a.m., making off in a north-easterly direction, after dropping bombs, as detailed in the official reports. They were pursued by aeroplanes and got away, although one of the airships appeared to be in difficulties near the Cormelles Fort.

Another alarm was given in Paris on Monday night, but the airship, after dropping bombs on Villers Cotterets, turned back.



## FROM THE BRITISH FLYING GROUNDS.

## London Aerodrome, Collindale Avenue, Hendon.

**Grahame-White School.**—Sunday, last week, Probationary Flight Sub-Lieuts. Ferrand circuits and eights; Reid, circuits; Hood, solo straights. Straights with instructors: Feeney, Jackson, and Mack; Hards, passenger flight.

Monday, Probationary Flight Sub-Lieuts. Ferrand and Reid, *brevet* tests, taking very good tickets; Hood, half circuits; Feeney and Hards, solo straights; Greer, Jackson and Mack, straights with instructor.

Tuesday, Probationary Flight Sub-Lieuts. Hood, Hards and Mack, half circuits; Feeney and Jackson, solo straights.

Friday, Probationary Flight Sub-Lieuts. Hards, Jackson and Mack, landing practice.

Saturday, Probationary Flight Sub-Lieuts. Hards and Hood, circuits; circuits with instructor; Mack and Jackson, landing practice; Greer straights with instructor.

Instructors for week: Messrs. Manton, Russell and Winter. Two tickets taken during the week.

**Beatty School.**—During last week the following pupils were out accompanied by the instructor: Messrs. Bond (44 mins.), Cornish (37), Roche (35), de Meza (15), Ormsby (37), Forbes (107), Bright (32), Laver (93), Vickers (30), Cooper (10), Leong (62), Morgan (7), Allcock (32), Chapelle (23), Fraser (34), Whincup (5), Bransby Williams (80), Wainwright (20), Watson (10), Boyle (15). The instructors were Messrs. G. W. Beatty, J. Roche Kelly, and C. B. Prodder, the machines in use being Beatty-Wright dual control and single seater.

During Friday afternoon the anaemometer registered 28 miles an hour, school work was in progress, instruction in wind flying being given to Messrs. Cornish, Ormsby, Forbes, Bright, Fraser, and Wainwright. Mr. Bransby Williams continued extra practice, and during the week did about 80 minutes' flying on the single-seater, Mr. Laver also flying the single-seater for about 30 mins.

**Hall School.**—Monday, last week, Cini and Mitchell 7 straights apiece; J. L. Hall taking passengers on No. 2. Pupils in full control of machines: Messrs. Furlong (45 mins.), Waterson (28), A. Davy (28) and Mitchell (28).

Tuesday, A. Davy, 12 good straight flights at 10 ft., Waterson (30 mins.) and Mitchell (10).

Wednesday, A. Davy (50 mins.), Cini (26), Mitchell (24) and Waterson (5); A. Davy doing good straight flights.

Thursday and Friday, wind.

Saturday, Lieut. Blyth 45 good straight flights.

Sunday, Instructor Rose several circuits testing air on Tractor 1. Lieut. Raymond Barker (17 mins.) and Lieut. Blyth (31) straights flights. Mitchell (17 mins.), Lieut. Raymond Barker 4 straights with full control. Lieut. Blyth 12 straight flights at 6 ft. and 3 half circuits.

The certificate of the week taken by W. J. McConnochie, height 1,000 ft. with good V.P. landing.

On Sunday, J. L. Hall at 4,000 ft. on *Brevet* Tractor 3. Instructors, J. L. Hall and J. Rose.

**London and Provincial Aviation Co.**—Monday, last week, school out 6 a.m. Test flight, M. G. Smiles, 10 mins.; Mr. Goodwin rolling; Messrs. Henderson, Derwin, and Deschamps straights; Messrs. Lincoln and Watson circuits. At 4 p.m. Mr. Goodwin rolling; Messrs. Henderson and Deschamps straights; Mr. Watson circuits and eights, now ready for *brevet*.

Tuesday, school out 6 a.m. M. G. Smiles test flight;

Messrs. Henderson and Derwin straights; Mr. Lincoln circuits; Mr. Watson circuits and eights, afterwards flying for and obtaining *brevet* in excellent style, attaining over 600 ft. in altitude test.

Wednesday, test flight, M. G. Smiles, 10 mins.; Messrs. Henderson, Deschamps, Derwin, Goodwin, and Abbott straights; Mr. McAuley (new pupil) rolling.

Thursday, test flight, M. G. Smiles, 6 mins.; Mr. Henderson straights, then half and whole circuits, making rapid progress; Messrs. Derwin and Goodwin straights; Mr. Abbott circuits; Mr. McAuley rolling.

Friday, too windy for practice.

Saturday, M. G. Smiles test flight; Mr. Derwin straights; Mr. Lincoln circuits.

Instructors for the week, W. T. Warren and M. G. Smiles.

**Ruffy-Baumann School.**—Monday, last week, on 60 Caudron: Kenworthy (14 mins.), Blandy (10), Jackson (12), King (15), Bell (12), and Roobaert (12). Rolling on 45 h.p.: King (12 mins.), Bell (16), Hydon (8), Blandy (3), Kenworthy (12), Roobaert (16), Cole (8), and Jackson (12).

Tuesday, rolling on 45: Jackson (8 mins.), Hydon (12), and Cole (8).

Wednesday, on 60 Caudron with E. Baumann: Blandy (8 mins.), Jackson (11), Bell (20), and Kenworthy (8). Rolling on 45 h.p.: Hydon (8 mins.), King (8), and Blandy (8).

Thursday, on 45 h.p.: Hydon (12 mins.), King (12), Kenworthy (12), Jackson (8), and Cole (4).

Saturday, E. Baumann out on 60 Caudron with Jackson. On 45: Jackson, Kenworthy, Hydon, Bell and Roobaert.



Copyright, F. N. Birkett, from the F.N.B. Series of Aviators.  
W. J. McConnochie, who has taken his ticket at the Hall School, Hendon.

Sunday, E. Baumann out on 60 Caudron with Messrs. Ruffy and Bell. On 45 h.p.: Messrs. King, Kenworthy, Jackson and Cole.

**Northern Aircraft Co., Ltd.**

**The Seaplane School, Windermere.**—Flying was possible on Monday, Tuesday, Wednesday, Saturday, and Sunday last week. Instructors: Messrs. W. Rowland Ding and C. L. Pashley. The following received

instruction:—Flight-Lieut. L. L. Atherton (64 mins.), Lieut. Lindsay Bainbridge (20), R. Buck (45), C. A. Barber (30), A. Johnson (29), F. H. M. Macintyre (10), J. L. Parker (23), G. L. Railton (15), J. F. Ridgway (31), H. P. Reid (29), S. J. Sibley (21), H. Slingsby (65).

Extra practice:—J. L. Parker and P. D. Robinson.

Machines in use:—N.A.C. propeller biplane, 50 Gnome, Avro tractor biplane, dual control, 50 Gnome.

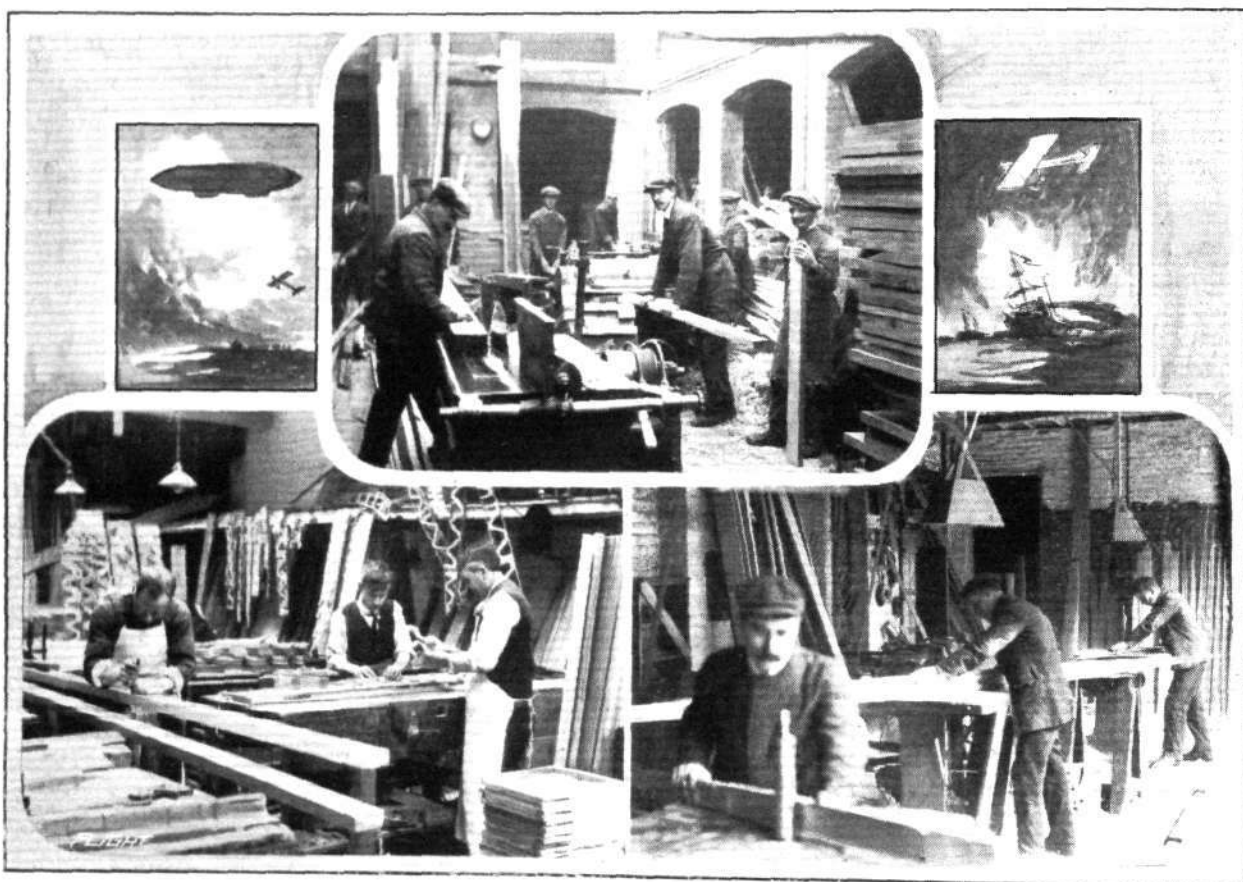


## WOODWORK IN AEROPLANE CONSTRUCTION.

ONE of the most serious difficulties in connection with the building of aeroplanes in the early days was in connection with the supply of suitable timber. Several wood-working firms have, however, been quick to realise the great future which is opening out before aviation, and are, therefore, doing all they can to make sure of that section of the industry which concerns them. Among such may be included Mr. R. Cattle, of 27, Wybert Street,

the various processes of manufacture some woodwork, forming portions of contracts on hand from several of the best-known aeroplane makers. The quality of the work was excellent in every way, and this was especially noticeable in a lot of B.E. ribs, which may be seen in our photograph on the left.

One point which cannot fail to impress the visitor to the works is the machinery—one of the largest wood-



THREE VIEWS OF MESSRS. CATTLE'S WOOD-WORKING SHOPS.—Top: The saw-mill and planing shop. Left: A corner of the assembling shop (note finished ribs). Right: One end of the spindle shop where the main spars are hollowed, &c.

"Flight" Copyright.

Stanhope Street, London, N.W., who is bringing the firm's forty years' experience, as timber experts and as specialists in high-class cabinet and joinery work, to bear in the machining and building-up of aeroplane wings, spars, struts, &c. In view of their long experience it is not surprising that in taking up—now some four years ago—this latest and by no means easy branch of woodwork, where men's lives depend upon sound material and good workmanship, they have met with every success. During a visit to the works the other day, when we secured some photographs, we were much interested in seeing in

working plants in London—and it is not without interest to note that most of it has been designed by Messrs. Cattle themselves. This has led to the evolution of some most ingenious machines, as for instance the one which turns oval picture frames from the solid.

As regards wood for aircraft Messrs. Cattle lay themselves out to supply, with special regard to quality of material and accuracy of construction, spars, struts (solid or hollow), ribs, fairings, longerons, &c., in best quality silver spruce or English ash, machined up to exact size to pass Government inspection.



# EDDIES.

FIRING with a machine gun between the blades of a propeller revolving at something like 1,200 r.p.m. strikes one as being a tricky, not to say risky, pastime, but I have it on good authority that it is the latest exploit of R. Garros the famous French pilot. As to how it is accomplished, at the present time wild horses shall not drag it from me, but the method is extremely neat and simple, and the result is said to have been the bringing down of two Taubes. According to a patent specification in a German



paper, an inventive genius over there has patented a device for enabling a machine gun to be fired through the disc area of the propeller by gearing up the trigger of the quick-firer to the engine in such a manner that when a propeller blade is in line with the gun a lock prevents the shot from being fired until the blade has passed out of the line of fire. It is very simple in theory, but difficulties are, I think, more than likely to arise in practice, and I must confess that I do not envy the gunner his task.

x x x

Mention of Garros reminds me of one of his compatriots, Pegoud, who has also been distinguishing himself by bringing down German machines, and has recently been awarded the coveted Military Medal. In the official note announcing the award, it is pointed out that Pegoud has repeatedly pursued hostile aeroplanes; on February 5th last he attacked a German monoplane and succeeded in bringing it down, whilst shortly afterwards he tackled two biplanes, of which the first one was sent tumbling down to *terra firma*, whilst the second was forced to make a hurried landing.

x x x

News and the accompanying snapshot of two other pilots who, although Frenchmen, we have almost come to regard as more or less belonging to this country, comes to hand from a friend at the front. Caporal P. Verrier is now nearly well again, but is still walking a bit stiffly with the aid of a stick, although he is in huge spirits. He certainly can't be accused of looking down-hearted, but then one can't imagine Verrier looking serious for any length of time. In our photograph he is seen wearing a miniature of his *Medaille Militaire*, awarded by the French Minister of War for special services. The other Hendon favourite may not, at first glance, be recognised, owing to the bushy moustache he has cultivated since leaving our shores, as Sergeant Louis Noel, who has qualified for the new *Croix de la Guerre*, by having been mentioned three times in the Army Orders. He also is in the best of spirits, and working with all the old energy of his Hendon days.

x x x

Capt. Oswald Watt, who is, it will be remembered, serving with the French air service, has figured in the

French *Journal Officiel*, having been decorated with the cross of a Chevalier of the Legion of Honour. His many friends over here and in Australia will be interested to know that the French officially describe him as a *pilote très hardi d'un sang-froid à toute épreuve et plein d'entrain*, sentiments with which we can most heartily agree. It is also mentioned that during a reconnaissance flight on October 24th, Capt. Watt's motor stopped over the German lines, and unable to regain the French lines, he succeeded in making a safe landing between the French and German lines, although the violent fire to which he was exposed put his machine *hors de service*. Both Capt. Watt and his observer escaped, and the machine was brought back to the French lines under cover of night. A few days later Capt. Watt was sent for a reconnaissance flight on a new machine, and was violently fired on by the German anti-aircraft guns. In spite of having his machine hit in several places—one bullet passing right through the left rear spar—Capt. Watt carried out his reconnaissance flight with the greatest *sang-froid*, and did not land until he had completed his task.

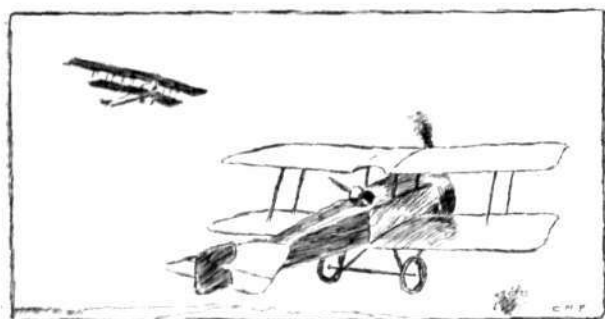
x x x

Although accounts of duels in the air are frequent enough in the daily press, these reports are generally more or less coloured, and frequently sound highly improbable. I was therefore very interested the other day in hearing from a pilot who was home on leave a description of a fight between an English and a German machine. My informant was stationed at—well, never mind, "somewhere in France"—when one day a German



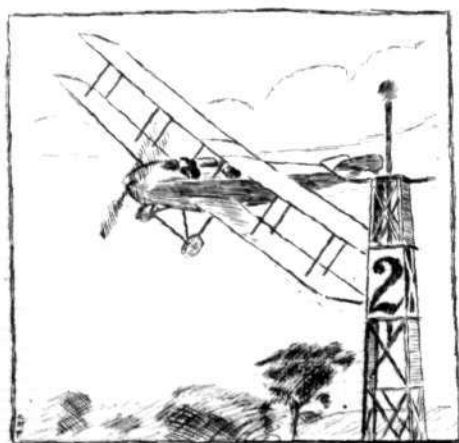
AT FARMAN'S BUC AERODROME.—A couple of Hendon's favourites who are on active service with our Allies—Corporal Verrier and Sergeant Louis Noel.

machine having slightly backswept wings (probably an Aviatik biplane) appeared over the town flying at a great height, and dropped three bombs in quick succession. After this heroic feat, the machine turned tail and headed towards the German lines. Two Bristol scouts were quickly away in pursuit, one of which returned after about an hour's absence, the pilot having been unable to find his quarry. Everybody was scanning the skies anxiously awaiting the return of the second Bristol when suddenly the Aviatik hove in sight again, probably, my informant thinks, to try to find out what damage his



bombs had done. Presently the second Bristol scout was seen some little distance behind the Aviatik, going—in the fluent flow of the story I did not quite catch the words used by my informant, but it was something to do with leather, and intended to convey the impression that the Bristol was not actually crawling along. It did not take the British 'bus long to overhaul the Aviatik, and as he flew past it, reports could be distinctly heard from the rifles which had been strapped on each side of the fuselage. Getting a short distance ahead of the German biplane, the Bristol was seen to swerve sharply and fly right across its course, evidently trying to head the German off. This performance was repeated several times, the Bristol crossing the nose of the Aviatik at very close quarters. Suddenly the Aviatik was seen to put its nose down, and presently flames were visible behind the engine, the machine falling to the ground a blazing wreck. The officer piloting the Bristol returned shortly afterwards, and was, needless to say, received with enthusiasm.

For the space of a few minutes it was quite like old times up at Hendon on Saturday last, when Hawker, who had arrived from "somewhere" on a new Sopwith two-



seater tractor biplane, circled the course several times, banking round the pylons in a way to gladden the hearts

of everyone who appreciates skilful piloting. Later in the afternoon Hawker gave another demonstration of his art by taking the big Sopwith gun-'bus out for several circuits over the surrounding country. His handling of this machine was simply superb, everyone looking on in amazement. Some even began to figure out that it must be an entirely new machine, as it had never before been known to fly at such a speed, or to climb so steeply, or to do such sharp banked turns. But it wasn't—it just meant that Hawker is able to bring out the very best points of a machine, and to get out of it every ounce that it is capable of. At one time Hawker on the Sopwith gun-'bus and Mr. de Havilland on the De H. I., were flying almost side by side, their speeds seeming practically even, and as the De Havilland does over 70 miles an hour, the speed of the Sopwith—when piloted by Hawker—must be pretty well the same.

After a short rest in dock, during which a few alterations have been made, the Mann and Grimmer biplane was out again for a flight at Hendon on the morning of Friday last. Those who saw the flights agreed that an enormous improvement was noticeable, and that the machine must have been doing close on up to the 70 miles mark, the Anzani engine pulling like a demon. It appears that the propellers with which the "Mann" was originally fitted were too big for the engine, and that the improvements were chiefly due to the fitting of different propellers. The pilot was, as in its first flight some time ago, Mr. Rowland Ding, who was highly pleased with the behaviour of the "Mann."

By the way, this week a few more details of the Mann and Grimmer creation appear on another page in FLIGHT, the Censor having now "released" these for publication. It will be remembered I hinted a few weeks ago, at official embargo having been temporarily enforced upon the issue of any particulars. The ways of officialdom are truly obscure.

Evidently things are humming at the Northern Aircraft Company's school at Windermere, in fact the number of pupils coming in has now reached such dimensions that it has been found necessary to increase the staff of instructors. In Mr. E. C. Pashley, whose good work at Shoreham is so well known, they have acquired a pilot who is not only a thoroughly capable man at the control wheel, but who has, moreover, had a long experience in tuition work.

Miss Katherine Stinson, the American aviatrix, to whose flying on the Wright reference has been made in these columns, evidently intends to change over to a different type of 'bus. Anyway she is having a new mount for exhibition work built for her by L. C. Partridge in a shed at the Cicero flying ground.

The looping craze seems to be spreading among our cousins "over yonder." I hear of several pilots who intend to get a view of mother earth while upside down, among others being an old friend, Earl Daugherty, who is having a special machine for stunt flying built by Max Stupar.

Who said "stunts" at Hendon for Easter?

"ÆOLUS."



# THE FLYING MACHINE: THE AEROFOIL IN THE LIGHT OF THEORY AND EXPERIMENT.

By F. W. LANCHESTER, M.Inst.C.E.

(Continued from page 199).

§ 7. *Real Conditions Restored.*—Now, when we take away the restriction as to the motion of the fluid, what is the result and what inferences can we draw? Firstly, it may be noted that the circulatory motion around the aerofoil will be far greater for one of high aspect ratio than for one of low, and if this represented lost motion or leakage the foil of high aspect ratio would be at an immediate and overwhelming disadvantage. But on the theory of the continuity of the vortex system the circulation in the vertical plane of flight around the aerofoil is a cyclic motion, which, compounded on one of translation (relatively to the motion of the aerofoil), constitutes a conservative system which neither gains nor loses energy, and results, in sum, in no permanent change in the air velocity or distribution; so the conditions as to the generation of the flank trailing vortices are not in effect ultimately different from those of the two-dimensional motion postulated as the basis of the argument of the preceding paragraphs. In other words, the air although receiving motions in the third dimension (the line of flight) has these motions so bound and regulated by the peripteral cyclic system, and the energy of these motions so strictly conserved, that the result is in effect the same as if the additional degree of freedom were denied to it.

In practice we know that it is not merely sufficient that the aerofoil should act as an obstacle to connectivity; it is also necessary, in order that the cyclic motion should conserve its energy, that the sectional form of the aerofoil should be conformable to the lines of flow. Thus, the forms shown in Figs. 7, 8, and 9 would not comply with this condition in a real fluid, they would set up eddies or generate vortices foreign to the régime. It is evidently necessary, as we already know, to adopt an arched form with a dipping front edge in order to meet the up current component conformably, and since this current is part of a system

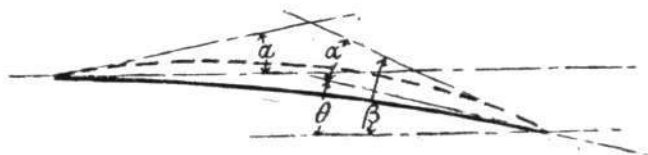


Fig. 13.

superposed on that proper to the flank vortices, this arched section must be regarded as obtained by the bending of the aerofoil beyond the curvature indicated by Fig. 11, as shown in Fig. 13.

§ 8. *The Aspect Ratio of Least Resistance.*—If we imagine the fore-and-aft dimension to be progressively reduced, with a corresponding increase in the aspect ratio, the velocity of the up current will locally become greater, for although the strength of the vortex motion will remain unchanged the velocity will be greater owing to the reduction in the circuit of the "core." Hence, the necessary steepness of the camber will become greater the less the "chord," and manifestly a point will be reached at which the steepness of the camber will itself set up eddies, when the resistance will be rapidly augmented with any further reduction of the chord dimension. In addition to the above, structural considerations also begin to tell; the aerofoil section has, so to speak, to "swallow" or contain the spar sections necessary for its strength, and the vertical depth of these spars cannot be reduced beyond a certain point; consequently, when the chord dimension is unduly limited the solid conformation of the aerofoil section is liable to become too bluff, and to offer excessive resistance.

On two counts, therefore, we have it that there is a practical limit to the reduction of the chord and the increase of aspect ratio, but there is still another. In designing a machine for variable flight speed, and in providing for slow flying, it is desirable to allow for the aerofoil being employed at other than its most desirable angle of attitude; when this is the case the supporting reaction is found to fall off more rapidly for an aerofoil of high aspect ratio than for moderate values.

On the other hand, the advantage of the chord reduction is mainly that, with the reduction of surface ("wetted" surface in the terms of the Naval Architect), the skin-frictional resistance is lowered, not quite in the relation of the reduction of surface, but nearly so; the point to be sought for in fixing the aspect ratio is evidently, therefore, that at which the increase of resistance as due to the two causes mentioned (steepness of camber and "form"), is equal to that saved on the score of skin-friction: this

is the ordinary condition for maximum or minimum value. We are unable to give any mathematical solution owing to the fact that the law connecting resistance with the two items *steepness* and *form* is unknown; in the absence of information on this point the solution is a matter for the Laboratory.

In discussing the hypothetical atmosphere confined to two-dimensional motion it was mentioned that an aerofoil of low aspect

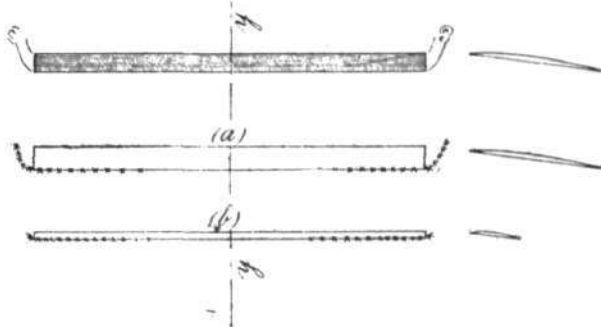


Fig. 14.

ratio, i.e., having considerable length in the line of flight, would not comply very closely with the ideal conditions as represented by an impulse, and that its lateral extremities will become the seat of motion of a character foreign to the régime. We may regard the lateral ends of the aerofoil as giving rise to two vortex sheets, Fig. 14 (a) (otherwise known as surfaces of discontinuity, or surfaces of gyration), which ultimately break up and become part of the trailing vortex system; now the points of origin of these vortices are more widely separated than the span (Fig. 14 (b)), and so the aerofoil of low aspect ratio may be expected to have a somewhat wider "seat" in the air than the high aspect ratio foil (c) of the same span. Were it not for this the load sustained by an aerofoil for a given amount of work done aerodynamically would depend upon its lateral breadth, and be independent of its chord dimension. Even as it is, we are by no means sure that this is not approximately the case, at least within certain limits, and the velocity at and around the axis of symmetry  $y, y$  (Fig. 14) will be somewhat less than at a short distance on either side. This might be construed to account for a peculiarity often noticed in the wing-plan of birds; the widest part of the wing is by no means always situated on the centre line,

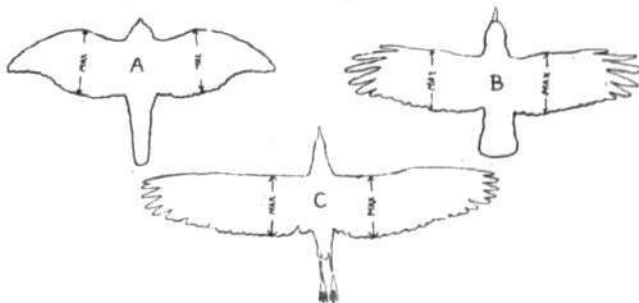


Fig. 15.—A, L'Epervier (Hawk); B, Rook (Author); C, Heron Gris (Mouillard).

or, rather, where the wings join the body; this feature is illustrated by the examples given in Fig. 15. The said figure also illustrates a feature which amongst birds is almost universal, namely, the grading down of the pressure towards the extremities; in the language of the aeronautical designer, the wing section is given a decided "wash-out" at the ends. This has been imitated to but a very slight extent in aeroplane construction. It corresponds according to the present theory to a very considerable reduction in the vortex strength towards the outer margins of the gyration surface.

§ 9. *Author's Present and Former Treatment Compared. Substantial Identity Demonstrated.*—To those who are familiar with the author's "Aerodynamics" the fact will be at once apparent that although the whole line of reasoning adopted in the present paper differs from that previously employed, the general result is

the same. On looking into the matter more closely it will also be observed how some of the conclusions given in the previous work as the outcome of lengthy investigations arise immediately and directly as the natural outcome of the new line of treatment. Thus the conception of the peripler area and peripler zone introduced into the author's "Aerodynamics" in connection with a discussion on the screw propeller, § 210 (Ch. IX.), and allowed to remain rather abstract in character, may now be identified as an area representing by its content the equivalent mass of the trailing vortices; it is here that we find the augmented mass of fluid in downward motion, which, according to the regular application of the Newtonian method, represents by its downward momentum the reaction of the sustained load. We know that in mathematical theory any free vortex ring or (in two-dimensional motion) vortex pair may be regarded as carrying the momentum communicated by the impulse by which it is generated,\* and so is the equivalent of some appropriate mass of fluid in motion; it is, strictly speaking, the vertical cross section of this hypothetical mass which, in the author's former work, constitutes the peripler area.

It will now be shown that the results given by the present line of reasoning are in substance identical with those obtained in the author's previous work. In both methods of treatment we have the aerofoil dealing directly with a cyclic component in the motion of the air, and ultimately leaving in the wake downward momentum whose value per second is the equivalent of the load sustained. Thus the direct action of the aerofoil is measured by the sum of the momenta of an up current received and a down current emitted; it is in fact the downward momentum represented by the continuous reversal in the vertical component of the flow of a mass of fluid, just as, for example, in the Pelton wheel. The energy spent or work done by the aerofoil is thus the difference between that received from the up current and given or imparted to the down current, or, in the symbols employed in the author's "Aerodynamics,"

$$W = \text{momentum/sec.} = m(\beta + \alpha)V$$

$$\text{energy/sec.} = m(\beta^2 - \alpha^2)V^2/2.$$

If the mass per second representing the trailing vortex pair, that passing through the peripler area, be denoted by  $M$  and  $v$  be its downward velocity, we also have

$$W = \text{momentum/sec.} = Mv$$

$$\text{energy/sec.} = Mv^2/2$$

or,

$$Mv = m(\beta + \alpha)V \quad (1)$$

and

$$\frac{Mv^2}{2} = \frac{m(\beta^2 - \alpha^2)V^2}{2} \quad (2)$$

by (1)

$$\frac{M}{2} = \frac{m(\beta + \alpha)V}{2(\beta^2 - \alpha^2)V^2} \quad (3)$$

or (2)

$$\frac{M}{2} = \frac{m(\beta^2 - \alpha^2)V^2}{2(\beta^2 - \alpha^2)V^2} \quad (4)$$

or,

$$v = (\beta - \alpha)V \quad (5)$$

also by (1)

$$M = \frac{\beta + \alpha}{\beta - \alpha} m \quad (6)$$

In the author's "Aerodynamics"  $\alpha/\beta$  is represented by a constant  $\epsilon$ ; substituting we have

$$M = \frac{1 + \epsilon}{1 - \epsilon} m \quad (7)$$

Now the mass per second  $m$  is that coming within the "sweep" of the aerofoil as defined by an area  $\kappa A$  ( $A$  being the area of the foil), hence the peripler area is

$$\frac{1 + \epsilon}{1 - \epsilon} \kappa A \quad (8)$$

The above is the result and in substance the reasoning given in § 210 of "Aerodynamics." Since our present basis is that of an aerofoil of fixed span and variable chord, we will take the span  $l$  as basis, and express the peripler area in terms of  $l^2$ ; thus, employing the values of the constants  $\kappa$  and  $\epsilon$  as given in the author's "Aerodynamics," we obtain the results given in Table I. Referring to this table, we see that the side of the square representing the peripler area varies from being approximately equal to the span  $l$  in the case of an aerofoil of aspect ratio = 3, to 0.83 in the case of aspect ratio = 12. Now the side of this square may be taken as roughly representing the base of the vortex pair, since the equivalent mass of a vortex pair is approximately equal to that of a mass of fluid represented by the content of the square on its base,† so that we have definitely a quantitative confirmation of the theory presented in the present communication based upon the constants determined by totally different and independent methods. Moreover, we find that so minute a matter as the influence of the

\* That any such vortex ring or pair does not as a whole contain momentum the author has definitely proved; however, we may nevertheless legitimately regard it as carrying a definite quantity of momentum just as though it were existent. The author suggests that this quantity should be termed the "pseudomomentum" of the vortex; it is ever equal to that of the impulse by which it is generated.

† In the case of a simple vortex pair generated by a uniform impulse as in Fig. 10, the area representing the equivalent mass is  $\pi/3$  times the square on the base  $x'x''$ , or approximately 1.05.

end effect or eddy, already noted, as tending to widen the base in the case of aerofoils of low aspect ratio, is accurately reflected in the figures obtained from the equation.

Aspect Ratio.	Constants.	$\kappa \frac{1 + \epsilon}{1 - \epsilon}$	$\sqrt{\frac{\kappa}{\pi} \times \frac{1 + \epsilon}{1 - \epsilon}}$
$n$	$\kappa$	$\epsilon$	
3	1.00	0.48	2.85
4	1.03	0.54	3.45
5	1.064	0.59	4.13
6	1.10	0.62	4.70
7	1.12	0.65	5.30
8	1.14	0.68	6.0
10	1.175	0.72	7.2
12	1.195	0.75	8.4
			0.975
			0.93
			0.91
			0.88
			0.87
			0.86
			0.85
			0.83

Again, we find complete harmony between the two lines of treatment in the interpretation of equation (5). We have already seen that in accordance with our present hypothesis the velocity  $v$  is (with reference to Fig. 11) given by the expression  $V \tan \theta$ . When, as in Fig. 13, we add the arched section representing the path of flow of the cyclic component as a superposed system we have the angle of dip, the  $\alpha$  of the previous investigation ("Aerodynamics") and an equal angle superposed on the angle  $\theta$ , making a total trail angle  $\beta = \theta + \alpha$ , and we have

$$(\beta - \alpha)V = [(\theta + \alpha) - \alpha]V = \theta V,$$

since we are working on the "small single hypothesis"† the  $v_1$  of the present investigation is identical with the  $v$  of equation (5), and we see that the present régime and that of the author's previous work give identical results.

The agreement between the results of the author's previous work and the present investigation is not to be regarded so much as an independent confirmation, but rather as a justification of the original theory, and as a development directed to elucidate much that might otherwise be regarded as obscure in the régime. Put concisely, the earlier investigation and the present deal with the same main problem, the mode of support, on the same foundation theory, but they begin at opposite ends; in the earlier work the cyclic motion around the aerofoil was taken as a basis and the remainder of the system was deduced as a corollary, the present line of argument begins with the ultimate or final step in the communication of momentum to the air in the trailing vortices, and works backwards to the motions and behaviour of the air in the more immediate vicinity of the aerofoil itself.

§ 10. Quantitative Theoretical Treatment.—The cyclic or vortex theory of the aerofoil is capable of yielding quantitative results quite apart from any experimentally determined pressure values or constants whatever. There are difficulties at present, due to the limitations of mathematical analysis, but these will be without doubt overcome: if the mathematician fails us we can fall back upon graphic methods.

Reverting to the hypothesis of § 6, we have seen that the simple "bifocal" vortex pair is impossible owing to the high velocity in the vicinity of the foci, or vortex filaments; this would betoken an aerofoil whose camber and angle  $\beta$  increased towards

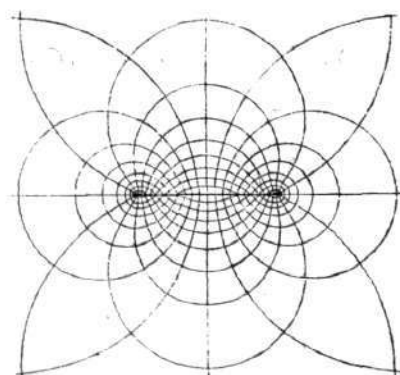


Fig. 16.

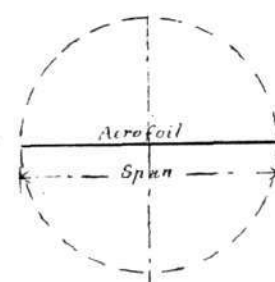


Fig. 17.

the lateral extremities to an indefinite degree, an altogether absurd and impracticable feature even from a theoretical standpoint. It has further been pointed out with reference to Fig. 11 that the more usual condition is that of uniform camber from end to end, but no attempt has been made so far either to carry the study of this

† The author's method, as employed in his "Aerodynamics," is based on the assumption that the angles concerned in the sectional form of the aerofoil (relatively to the time of flight) come within the definition of a small angle, i.e.,  $\phi$  (in circular measure) =  $\sin \phi = \tan \phi$  within permissible limits of error.



condition to its logical conclusion, or more generally to examine the relation which exists between the appropriate aerofoil camber and the vortex distribution.

If we take as our basis for the purpose of illustration the case of uniform camber, at least if we suppose that which we may term the *primary* camber (Fig. 11) to be uniform, we have the appropriate two-dimensional vortex solution ready to hand, for the linear motion impressed on the fluid will be constant throughout the length of the span, and the resulting system will be identical with that due to the *normal motion of a plane* the equations of which have been solved and the curves of flow plotted, Fig. 16. In the interpretation of this figure it is necessary to suppose an impulsive force applied to the plane, the latter then being withdrawn: in reality, the plane must be supposed to move through a short finite distance, and in our problem as it stands the line

ordinarily understood to be the plane is actually a section of the aerofoil, and its brief motion represents the change taking place as the aerofoil traverses the vertical stratum represented by the plane of the paper.

When the aerofoil has passed through the stratum under consideration, the latter is left without any break in its continuity and with the motion as defined by its stream lines intact. The motion then becomes a vortex system, the core being constituted by the wake of the aerofoil as a vortex sheet or surface of gyration, as described with reference to Figs. 4 and 5. The *equivalent mass* of this particular system is known, it is equal to that of a cylinder of circular section of diameter equal to the width of the plane, *i.e.*, the span of the aerofoil. In other words, the peripteral area =  $\pi l^2/4$  where  $l$  is the span.

(To be concluded.)

## AIRCRAFT AND THE WAR.

In a special cable to the *Daily Mail* on the 16th from Tenedos, Mr. G. Ward Price, describing the Fleet in the Dardanelles, said:—

"There is every kind of craft from the giant 'Queen Elizabeth' to the little trawlers that fish up the mines, two big green and white hospital ships, the waterplane ship 'Ark Royal,' with her funnel set far aft and a long open foredeck on which waterplanes perch, with two cranes to swing them overboard."

A *Daily Mail* correspondent at Salonica reported under date of March 16th:—

"A British waterplane has fallen, breaking a plane, but the air-men escaped with slight injuries. Other waterplanes continue the work of reconnaissance."

Mr. Perceval Gibbon, writing to the *Daily Chronicle* on March 17th regarding the fighting round Ossowitz, said:—

"The Germans, as usual, are very strong in aeroplanes, of which several have been shot down, and one, which is stated not to have been hit, turned over and fell on the railway and was there blown to pieces by the explosion of its own bombs."

A *Daily Telegraph* correspondent at Havre, writing on March 17th, said:—

"A Taube, which dropped eleven bombs on Poperinghe, killed eight people including three children, one woman, and two soldiers, whilst twenty persons, of whom seven were children, were wounded. One of the soldiers had both his legs shattered, and an immediate amputation was deemed necessary."

A *Daily Chronicle* correspondent in Paris reported on March 18th:—

"On Tuesday a Taube passed over the village of Dampierre les Bois, in the Belfort district. The only target available was a funeral procession, and on this the German aviator dropped two bombs. Possibly from his altitude he took the procession to be an ammunition convoy. Fortunately the bombs did no damage."

The German "wireless" news of the 18th inst. contained the following:—

"The German Main Headquarters to-day reports: French air-men dropped bombs on the open Alsatian town of Schlestadt, of which only one was effective, exploding on a school, killing two girls and seriously wounding ten. As a reply the fortress of Calais was last night bombarded with bombs of the heaviest type."

The *Daily Telegraph* correspondent at Copenhagen sent the following on the 18th inst.:—

"A Zeppelin airship was observed to-day over the Femernbelt, coming from the east. Thence it passed over Roedby Harbour in Denmark, and disappeared in a westerly direction. It is supposed that it was on its way to the North Sea and England."

An Exchange message from Copenhagen on the same date said:—

"A Zeppelin was observed to-day from Rodby, in the Baltic, coming from the east and going very high in a westerly direction as if making for Kiel."

Writing from Tenedos on March 18th, describing the sinking of the French battleship "Bouvet," a *Daily Telegraph* correspondent said:—

"Just at this juncture a seaplane left the aeroplane ship anchored

below us, and flying over the lines of ships, disappeared in the distance up the Straits."

The following is taken from the *Vossische Zeitung* of Friday last:—

"Great indignation has been aroused among the people of Upper Alsace over the raid of a French aviator, who threw bombs on Colmar. On Thursday the aircraft was sighted above Habsheim. The aviator threw bombs at the hangars of the flying corps, but his aim missed. In consequence of the heavy fire directed at him the airman turned in the direction of Altkirch, where he threw more bombs, but damaged nothing."

According to a report from Sofia on Saturday, some fifteen German airmen in the service of Turkey have left Constantinople to return to Germany.

According to the Danish *Politiken*, Germany has established an extensive flying base on the Island of Sylt, the largest of the North Frisian Islands, fifty miles north-east of Heligoland. The two German airmen who were rescued are evidently young pupils out for their first lengthy trial flight when they met with disaster. The remnants of the machine have been brought to Esbjerg.

A *Daily Chronicle* correspondent at Geneva reported the following on March 21st:—

"At Habsheim, near Colmar, three French airmen from Belfort destroyed two new army Taube machines and four sheds. Several regiments of recruits, who were manœuvring under staff officers, fled into the forest. One airman, who was flying low at 500 yards, had his machine riddled with bullets, but all returned safely. Colmar and Habsheim are in Alsace."

The following details regarding two British aviators who were said to have landed on Dutch territory and been interned were reported by the *Sluis* correspondent of the *Telegraaf* on Sunday:—

"At half-past seven yesterday morning they left Calais, flying across Ypres and Roulers on a reconnoitring flight. They had no bombs, and were only armed with revolvers. When above Roulers the Germans bombarded them with shrapnel. From Roulers they directed their course to Bruges, and then in an easterly direction along the great Ghent road to Maldegheem."

"Bullets," they said, "zipped around us, but did not reach us. Soon we observed that our motor was not working properly. There was apparently a defect. We had to choose between landing on the German or the Dutch side, and naturally endeavoured to cross the frontier."

"The airmen passed over St. Lawrence and St. Margareth till they reached a point between St. Kruis on Dutch territory and Oostburg. Slowly they came down on a meadow, at about ten o'clock."

In the German "wireless" news sent out from Berlin on Sunday, there was the following:—

"Main Headquarters reports:

"In the western theatre of war an English flying machine was shot down south-east of Ypres. The occupants were taken prisoners."

"To emphasise our reply to the misdeeds of the French airmen in the open Alsatian town of Schlestadt more forcibly, a few large bombs were dropped during the night on the fortress of Paris and the railway junction at Compiègne by our airships."

According to a Central News message from Amsterdam on Monday, persons who had arrived at Maastricht from Liège stated that on Saturday a Zeppelin airship was wrecked at Liège. No further details have, however, yet been reported.

The *Journal* on Monday reported the following:—

"On Saturday two German aeroplanes flew over Nancy, one at a quarter to eight in the morning and the other half an hour later. After being violently bombarded they were obliged to retire without having succeeded in throwing any bombs."

The Tenedos correspondent of the *Tribuna*, writing on Monday, said:—

"Mine-sweeping operations in the Dardanelles were resumed during the night of Friday, and at dawn the aviators of the Allies succeeded in making above the recently bombarded forts reconnaissances which showed that the operations have been extraordinarily efficacious."

Mr. H. Hamilton Fyfe, writing to the *Daily Mail* from Petrograd on Monday regarding the fall of Przemyśl, said:—

"On Sunday three free balloons were sent up. This was an attempt by staff officers to get away with documents of military value which they did not wish to fall into the Allies' hands. Luckily for us the wind changed, and instead of escaping all three came down on Russian territory. An aer. plane with letters was brought down last Thursday, and a perusal of the letters showed that the garrison was suffering from lack of food. The horses especially were in bad case and were eating old straw-thatched roofs."

In an account of the siege of Przemyśl, in the *Daily Telegraph*, there was the following:—

"It is interesting to note the use made of aeroplanes during this siege. Communication between the fortress and the Austrian lines seems to have been maintained almost daily by means of aviators, who kept up a regular post, taking out letters and bringing back as much stores as their machines could carry. One of these aviators was able to carry as much as 4 cwt. on his machine, and used regularly to bring out two sacks of letters and cards. Balloons were also employed, and only last Friday an aeroplane and three balloons with officers and mails left Przemyśl, but were driven from their course by a change of wind, and had to come down in Russian territory."

✱ ✱ ✱ ✱

## SAFETY GOGGLES FOR FLYING.

To ensure protection to the eyesight in case of a mishap when flying is probably the most important precaution which should be taken by a pilot, and this more especially applies to those pilots who are on active service. In this connection the Triplex Safety Glass Co.'s goggles are fortunately available, and the accompanying photograph which we publish points the moral in a convincing manner. The goggles at the top were worn by a flying officer who recently met with a fatal accident, and it will be seen that the lenses must have obviously encountered some serious blow, which, had he not been killed, and had he been wearing ordinary glass goggles, would without much doubt have caused him the loss of his sight. In sending these goggles to the Triplex Co., a friend of the unfortunate officer wrote, under date of February 26th, as follows, names, &c., being naturally omitted by us:—

"The enclosed pair of goggles may interest you. They are the pair worn by the late Lieut. —, who was unfortunately killed in an aeroplane accident here on the —."

"The machine fell practically vertically some 300 feet, nose first, the engine being (in front) forced some 2 feet into frozen ground and the entire machine completely wrecked. The speed must have been over 100 m.p.h."

"The unfortunate pilot's face was completely wrecked by the instrument board, but the goggles were found in the condition you will find them—still in position."

"Please let me have your price lists of goggles."

On Tuesday *L'Information* published the following report:—

"A Taube yesterday flew over Mon-Desert at Nancy. Attacked by artillery, it had to turn, and fell, with one wing broken, near Malzeville. It has also been ascertained that one of the Taubes shot at on Saturday was brought down in the German lines."

In the German report issued on Tuesday there was the following:—

"Hostile airmen again dropped bombs on Ostend, but no military damage was done, though several Belgians were killed or wounded."

"North-west of Verdun a French airman was brought down."

"A French aeroplane, with two non-commissioned officers, was forced to descend near Freiburg, and both airmen were taken prisoners."

Mr. James Dunn, writing to the *Daily Mail* from Rotterdam on Tuesday, said:—

"Clouds of Allied aeroplanes were scouting this afternoon. All the German guns have been removed from Westcapelle to the Yser, and a big battle is imminent."

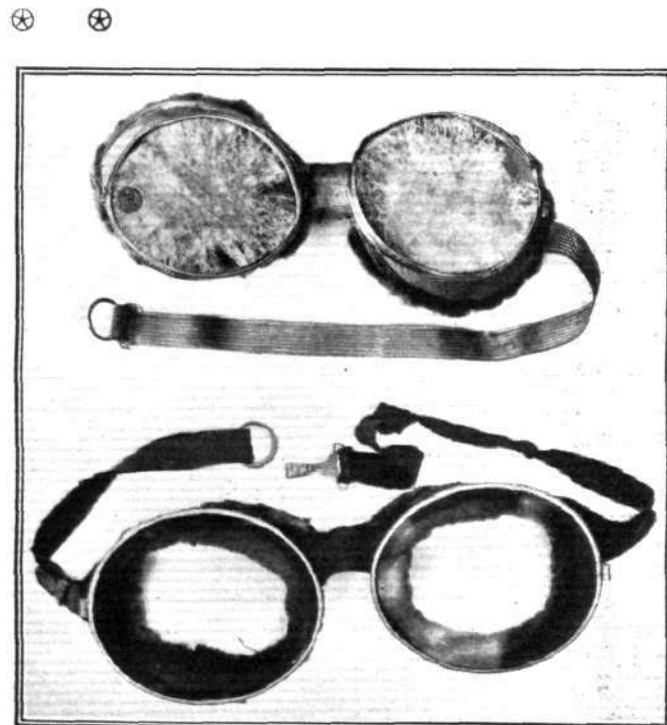
"The Allied aeroplanes have been taking advantage of the perfect spring weather and have appeared in great numbers over the Belgian coast, being furiously shelled by the batteries along the sea shore. Bombs were dropped on Ostend yesterday and did considerable damage to stores."

A telegram received from Cetinje stated that on Wednesday three Austrian aeroplanes threw thirteen bombs on Antivari, six on Virpazar, and two on Niegushi, all without effect. For two days Austrian torpedo boats have been making sorties from the Bocche di Cattaro, cruising to San Giovanni di Medua.

Regarding the air raid on Antwerp on Wednesday, the official report of which is given on page 206, the Bergen-op-Zoom correspondent of the *Telegraaf* reported:—

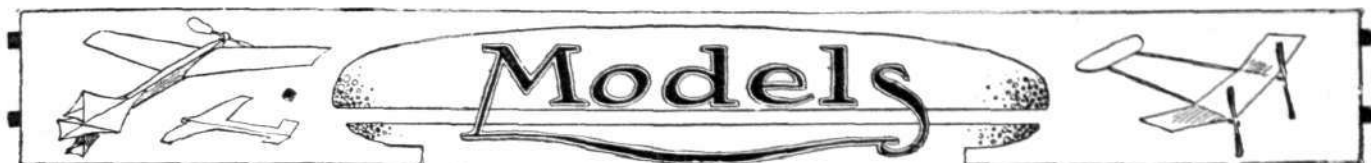
"It was seven o'clock this morning that a British airman appeared above Antwerp and dropped bombs on the Cockerill Dockyards at Hoboken, where submarines are being constructed. The Germans fired their anti-aircraft guns, and one shrapnel shell fell on the Groen Place."

"The British aviator succeeded in outwitting the German aviators who rose in pursuit, and flew over Stabroeck, where the forts opened fire. He finally disappeared in the direction of Antwerp."



Two pairs of Triplex safety glass goggles, the top photograph showing the glass intact after an accident to a flying officer at the front, to which further reference is made on this page.





Edited by V. E. JOHNSON, M.A.

### Professor Langley's Model Work.

(Continued from page 201.)

"I PASS OVER a subsequent period of baffled effort with the statement that numerous devices for launching were tried in vain, and that nearly a year passed before one was effected. Six trips and trials were made in the first six months of 1894 without securing a launch. On October 24th a new launching apparatus was tried for the first time, which embodied all the requisites whose necessity was taught by previous experience, and, saving occasional accidents, the launching was from this time forward accomplished with comparatively little difficulty.

"The models were now, for the first time, launched fairly into the air, and a new class of difficulties arose, due to a cause which was at first obscure, for two successive launches of the same model, under conditions as near alike as possible, would be followed by entirely different results. For example, in the first case it might be found rushing, not falling, downward and forward into the water, under the combined impulse of the two engines; in the second case, with every condition (apparently) the same, it might be found soaring upward until its wings made an angle of 60° with the horizon, and unable to sustain itself at such an angle slide back into the water.

"After a great deal of embarrassment the trouble was discovered to be due to the fact that the wings, though originally set at precisely the same angle in the two cases, were irregularly deflected by the upward pressure of the air, so that they no longer had the form which they appeared to possess the moment before they were upborne by it, and so that a very minute difference, too small to be noted with certainty, exaggerated by this pressure, might cause the wind of advance to strike either below or above the wing, and to produce the feature referred to. When this was noticed, all the models were inverted, and sand was dredged uniformly over the wings until the weight represented that of the machine. The flexure of the wings under these circumstances must be nearly that in free air, and it was found to distort them beyond all anticipation. Then commenced another series of trials, in which the wings were strengthened in various ways, but in none of them, without incurring a prohibitive weight, was it possible to make them strong enough. Various methods of guying them were tried, and they were rebuilt on different designs, a slow and expensive process. Finally, it may be said in anticipation (and largely through the skill of Mr. Reed, the foreman of the work) the wings were rendered strong enough without excessive weight, but a year or more passed in these and other experiments.

"In the latter part of 1894 two steel models had already been built, which sustained from 40 to 50 per cent. of their dead-lift weight on the pendulum, and each of which was apparently supplied with much more than sufficient power for horizontal flight (the engine and all the moving parts furnishing over one horsepower at the brake in one of the models, weighed but 26 ozs., but it may be remarked that the boilers and engines in lifting this per cent. of the weight did so only under favourable conditions on a bench test, and that nothing like this could be counted upon for regular performance in the open. Every experiment with the launching apparatus, when the model descended into the water, not gently but imperilled by the misdirected power of its own engines, resulted at this stage in severe strains and local injury, so that repairing, which was almost rebuilding, constantly went on—a hard but necessary condition attendant on the necessity of trial in the open air. It was gradually found that it was indispensable to make the frame stronger than had hitherto been done, although the absolute limit of strength consistent with weight seemed to have been already reached, and the year 1895 was chiefly devoted to the labour on the wings, and what seemed at first the hopeless task of improving the construction so that it might be stronger without additional weight when every gramme of weight had already been scrupulously economised.

With this went on attempts to carry the effective power of the burners, boilers and engines further, and modification of the internal arrangement and a general disposition of the parts such that the wings could be placed further forward or backward at pleasure to more readily meet the conditions for bringing the centre of gravity under the centre of pressure. So little even now had been learned about the system of balancing in the open air, that at this late day recourse was had to rubber models, of a different character, how-

ever, from those previously used; for in the latter the rubber was strained, not twisted [Aeromodellists should note this point; several very ingenious modes of doing this have been published in FLIGHT, one quite recently]. These experiments took up an inordinate time, though the flight obtained from the rubber motors thus made was somewhat longer and much steadier than that obtained with the Penaud form, and from them a good deal of valuable information was gained as to the number and position of the wings and as to the effectiveness of different forms and dispositions of them."

(To be continued.)

### The Possibilities of an Aerial Torpedo Controlled by Wireless.

The *Sphere* of March 13th, under the above title, publishes a two-page article (profusely illustrated) by a correspondent, and some notes relating to the same, by its aviation expert.

The communication appears to have been prompted by some successful experiments in which a small dirigible was successfully steered and manoeuvred within the confines of an ordinary music hall by a wireless operator on the stage, and the successful trials of the American radio-controlled torpedo boat, "Natalia," the invention of Dr. John Hays Hammond, jun. This latter pilotless craft is designed to travel over the water's surface by wireless control only, her motors and steering gear being controlled by wireless controlled from the shore. A load of explosives totalling 4,000 lbs. can be carried by this novel weapon of attack. The idea of controlling a boat by wireless is no new thing; it was first worked out, we believe, by Nikola Tesla. We have, too, the electrically controlled torpedo of Armstrong and Orling, and others that we could name. Last year, long before the war, the writer strongly urged some of the most advanced aeromodellists to consider the question of the wireless control of model aeroplanes.

Leaving out altogether the idea of carrying anything in the nature of an explosion chamber and explosive, the question is one of a very formidable nature indeed.

The correspondent in the *Sphere* says that the span could be quite small, with a wing span of about 10 ft.; the illustrations show a monoplane, too, at that. With this spanned machine it is proposed to carry, in addition to a petrol engine and accessories, an explosion chamber, and, of course, explosives, a wireless control containing switches operating the various levers, wireless aerials, engine throttle control rod, rudder controls, and elevator plane control rods. The model is to be stabilised on the "Dunne" or some similar principle. The aerial torpedo would be controlled by an observer seated in an aeroplane, who would steer it in any direction and remain in safety himself. At night-time it would be operated by covering the wings with phosphorescent paint. In conclusion, the correspondent says: "Having given a rough idea of the design and possibilities of this weapon, I leave it to our engineering experts to decide whether such a machine is within the realms of possibility."

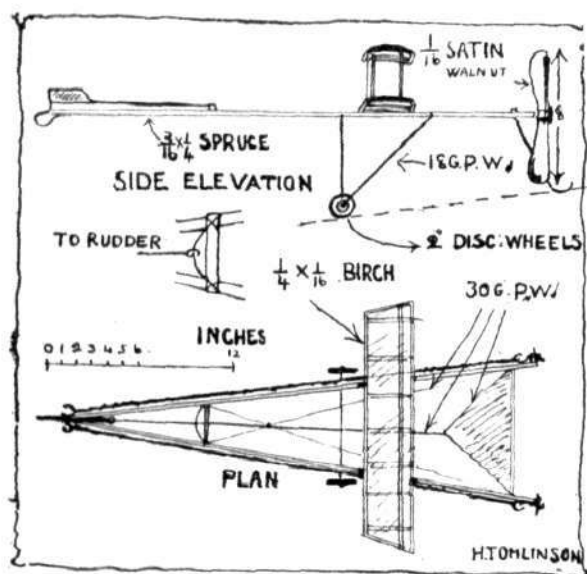
The aviation expert of the *Sphere* in his remarks says: "Although the machine illustrated is of a type that could scarcely be used successfully as suggested, the idea is certainly feasible, and will, no doubt, in later years be so perfected that it will prove a menace to the large aeroplanes that will come into being. . . . It is highly probable that the first flying torpedoes . . . (to) attain any practical success will, in a way, follow the form of the 'flying sticks' of the aeromodellists of to-day. They will be high-powered for their size, and driven by a small petrol engine driving twin propellers at the rear; the planes will be so constructed that they will have automatic stability [They have this already], and will carry a small wireless receiver to catch the waves sent out from the controller below, who will thus be enabled to guide them to their mark. In the nose of the machine will be placed the explosive, which will burst on contact. These miniature machines will have to be so constructed so as to have a good gliding angle so that should the engine fail the operator can bring them down in a spot where the explosion of their bomb will do no harm. The wireless apparatus would be carefully tuned. At present the science of aviation is not advanced far enough for us to construct reliable small machines of this type, but the idea is not so fantastic as it at first appears, and without doubt the flying torpedoes of the air will enter the realms of actuality."

It is, of course, quite impossible for anyone to say what will or what will not come to pass in the future. Up to the present the

wireless controlled marine torpedo does not appear to have come into actual use in spite of the hopes of inventors and prophecies of many writers; and the marine article is a hundred times easier to carry to a practical issue than is the aerial one. Unless some far more powerful motor was invented than even the petrol one, we can see no prospect of any small aerial torpedo, but an aerial machine, full sized, pilotless, and controlled by wireless, and carrying its torpedo or explosive charge, does certainly seem within the range of possibilities. Perhaps, however, by the time that that comes to pass, the size of the present-day full-sized machine will have so increased that such a machine would be but a model (using the term in its usual sense) in comparison. When the war is over, and wireless experiments once more permitted, it is not, perhaps, too much to hope that the subject of wireless-controlled model aeroplanes will be encouraged. In the past, wireless amateur workers have been by far too much centred in wireless telegraphy—but one branch of what wireless waves can do; and the coherer and relay, the starting of motors and other moving parts at a distance by such means have been sadly neglected.

## Mr. H. Tomlinson's High Flying Model.

From Mr. Tomlinson come drawings of a canard or pusher biplane. In sending them he says: "I saw some time ago you were asking for high-flying models. This model, although not designed for high flying, keeps throughout its flight at an altitude



Mr. H. Tomlinson's model.

of well over 100 ft. This result was obtained by using fine pitch propellers. With propellers of coarser pitch, the distance was not improved, because more rubber was required. The power used is 10 strands of  $\frac{1}{16}$  in. rubber, obtained from the 'Star' Model Aeroplane Co. The planes are covered with Clarke's Aero Silk. Longest flight, 390 yds. Duration, 68 secs."

## Stony Stratford Model Aero Club.

We have received from the Hon. Sec., Mr. O. Hamilton, jun., a copy of the first club magazine, January, 1915, which is to be published monthly, consisting of a number of typewritten pages. The contents bill is as follows: "Editorial Foreword; Field Jottings; Club Notices and Special Minutes; Mems. for Designers; Echoes from the Test Bench; Topical Review; Answers to Riddles." From the pages we take the liberty of extracting the following from "Mems. for Designers":—"In preparing a design for an r.o.g. always place the chassis in such a position that it shall be in front of the c.g. (centre of gravity) of the whole machine. Mr. Matson, I believe, recommends 2 to 3 ins. forward of the c.g.; this makes it possible for the model to rise off grass, also it prevents 'hunting.' That the angle of inclination or slope of the machine to the ground be between 1 in 8 and 1 in 12. That wheels made from plywood are the most suitable for models up to about 12 ozs., showing, as they do, an appreciable saving in weight over the smallest aluminium disc or spoke wheels. [Yes, if the diameter be the same in both cases.—V.E.J.] Can any reader give an explanation for the increased efficiency of a model when the elevator is placed on an outrigger above the fuselage? [There is less interference—the main plane not being in a line with the elevator does not impinge on air already acted upon by the elevator, or not so much so, at any rate.—V.E.J.] On the whole the magazine contains a considerable amount of interesting matter, and is a very praiseworthy first number. It

shows also that the club, or, at any rate, some of its members, are not lacking in energy, a vital asset to any club.



## AFFILIATED MODEL CLUBS DIARY.

Club reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

**Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).**

EASTER Monday competitions: A stop watch is offered as first prize, and aero material value 2s. 6d. as second prize for the best series of flights with models of any type. Research work competitions: A silver medal is offered for the greatest number of successful timed flights over the measured course with a tail monoplane, which must be so designed as to be used as a tractor, and as a pusher, without altering the resistance of the model. A bronze medal is offered for the most successful demonstration of anchoring a model in a rough wind on the flying ground. The device must be applicable to use with full-sized aeroplanes. These two competitions will remain open until the hay season.

**Sheffield Ae.C. (41, CONISTON ROAD, ABBEYDALE, SHEFFIELD).**

A GENERAL meeting will be held on Thursday, April 1st, at 8 p.m., in the room over sweet shop belonging to Mr. Broomhead, Leopold Street (opposite the Grand Hotel). It is essential that all members should be present, so that the summer programme can be completed. Any enthusiasts who are interested in aeronautical science, and wish to become members of the club, will be welcomed at the above meeting.



## A Non-Poisonous Dope.

RECENT happenings in connection with aeroplane dope have quickly brought forth a new composition which it is claimed does not give off any deleterious vapours. This comes from the British Aeroplane Varnish Co., Ltd. of Milburn House, Newcastle-on-Tyne, a company which is an offshoot from the old-established British anti-fouling composition manufacturers of Holzapfels, Ltd., Newcastle, with half a million capital. The dope, which is being marketed under the name of "Titanine," is devoid of tetrachlorethane and similar noxious spirits, so that the drawback of employees being affected when working the dope, it is claimed, is entirely eliminated. Next week we purpose giving some further interesting particulars which we obtained during a recent visit to the London offices at 57, Fenchurch Street, E.C.

## Index and Title Page for Vol. VI.

THE 8-page Index for Vol. VI of FLIGHT (January to December, 1914) is now ready, and can be had from the publishers, 44, St. Martin's Lane, London, W.C., price 6d.



## Aeronautical Patents Published.

Applied for in 1914.

Published March 25th, 1915.

5,214. A. B. THAW. Stabilisers.  
8,008. G. JUCHMES. Airships, &c.

## SPECIAL NOTICE.

EASTER HOLIDAYS.—Owing to the fact that Good Friday falls in next week, it is necessary for the next issue of FLIGHT to close for Press on Tuesday, March 30th. All copy, Editorial or Advertisement, must therefore be at the Office, 44, St. Martin's Lane, not later than first post on Tuesday morning.

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